

External Technical Review Summary

United States Department of Energy Office of Environmental Management (DOE-EM)

External Technical Review of the Flowsheet for the Hanford Waste Treatment Plant (WTP)

Why DOE-EM Did This Review



The Hanford Waste Treatment and Immobilization Plant (WTP) is being constructed to treat the 53 million gallons of radioactive waste, separate it into high- and low-activity fractions, and produce canisters of high-level (HLW) glass (left) and containers of low-activity waste (LAW) glass (right). At the time of this review, the Plant

was at approximately 70% design and 30% construction completion. *The external review objective was to determine how well the WTP would meet its throughput capacities based on the current design, identify any major issues that would prevent the WTP from operating, and identify any major or potential issues that would prevent the WTP from meeting contract rates with commissioning and future needs.*

What the ETR Team Recommended

The ETR Team recommends that the following issues be addressed to ensure throughput and reliability:

- Slurry transport piping has not been consistently designed to minimize plugging.
- Mixing systems designs were inadequate which will lead to insufficient mixing, extended mixing, vessel erosion and issues with large particles/settling.
- The WTP design has not been demonstrated to be sufficiently flexible to process all of the Hanford waste streams at design throughputs.
- Many of the process operating limits have not been completely defined making it difficult to define operating ranges for each unit operation.
- The current commissioning plans did not demonstrate long-term mission capabilities for equipment repair/remotability, especially for large and unique pieces of equipment and piping.

- The Pretreatment Facility has inadequate ultrafilter area and flux, undemonstrated leaching processes, instability in the baseline ion exchange resin, and operability and maintainability design issues.
- Adequacy of the control strategy, effect of recycle on capacity, and the decontamination factor have not been demonstrated for the evaporator design.
- Ion exchange development was inadequate including column design, cross-contamination control, valving complexity and effectiveness of cesium-137 monitoring.
- The control strategy for the LAW Vitrification Facility will likely lead to mis-batching of melter feed.
- Difficult to remove plugs will likely form in the HLW melter film cooler or the transition to the off-gas system resulting in glass production losses.
- Lack of a spare melter for both the HLW and LAW Vitrification Facilities increases the risk of loss of operation for extended periods.

What the ETR Team Found

The ETR team identified 28 issues, seventeen of which were categorized as major issues that would prevent the WTP from meeting contract rates and identified one issue, plugging, that could prevent the WTP from running consistently, and that the design approach did not minimize this risk. All of the issues are believed to be fixable without the development of new technologies and some of the fixes were already underway. The ETR team believes that the WTP project lacked a clear mission and shared vision (e.g. there was a lack of agreement about required throughput and how that translated into length of mission). Unless there is a clear mission statement, the owner and contractor cannot develop an effective shared project strategy. This includes agreement on throughput, adequacy of the basic data, and adequacy of preliminary flowsheets and piping and instrumentation diagrams.

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The purpose of an External Technical Review (ETR) is to reduce technical risk and uncertainty. ETRs provide pertinent information for DOE-EM to assess technical risk associated with projects and develop strategies for reducing the technical risk and to provide technical information needed to support critical project decisions. Technical risk reduction increases the probability of successful implementation of technical scope. In general, ETRs assesses technical bases, technology development, and technical risk identification and handling strategies.



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